



FOREST PEST MANAGEMENT

Pacific Southwest Region

82-31

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AN EVALUATION OF INSECT AND DISEASE CONDITIONS
AT RECREATION AREAS OF LITTLE GRASS VALLEY RESERVOIR,
LA PORTE RANGER DISTRICT, PLUMAS NATIONAL FOREST

LAT 39.73707 LON -120.96944

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ABSTRACT

Several significant pests were identified in the campgrounds and adjacent areas on the east side of Little Grass Valley Reservoir. These included annosus root disease in the true firs and Jeffrey pine; dwarf mistletoes in red fir, Jeffrey pine, and lodgepole pine; Indian paint fungus in red fir; and Atropellis canker and pine engraver beetles in lodgepole pine. Locations of some of these pests are illustrated on maps. Overstocking is also an adverse influence on the vigor of the vegetation in some areas. Management alternatives are presented that, if implemented, would have various effects on the pests and the future of the vegetation in the recreation area.

INTRODUCTION

On June 14, 1982 we met with Cleburne Smith, Ann Murphy, Brad Seaburg, and Mike Heath of the La Porte Ranger District and visited the Little Beaver, Red Feather, and Running Deer Campgrounds and adjacent areas (approximately 160 acres in all) on the east side of Little Grass Valley Reservoir. The District is interested in the addition of pest management considerations to the development of their vegetation management plans for the area. In addition, they are concerned about the considerable blowdown in certain areas of the campgrounds. The following report provides our observations, maps of the locations of pests, our prognosis, and management alternatives that would have various effects on the pests and vegetation in the area.

OBSERVATIONS

See Appendix 1 for the biology of pests in the recreation area and Appendix 2 for maps of the campgrounds with the locations of pests.

Little Beaver Campground

The principal species in this campground are red fir, white fir, lodgepole pine, Jeffrey pine, and incense-cedar. Most of the campground is adequately stocked to overstocked; however, the stocking in loop C has been reduced considerably because of the windthrow of red fir. The amount of lodgepole pine is highest in loop A, with dense thickets of regeneration along the reservoir shoreline and at the east end of the loop. Loop B has a good mix of species and size classes, although stocking is high in certain areas. Loop C is vegetated primarily by old-growth red fir, especially on the south and east sides. Both the understory and overstory are sparse, with numerous stumps throughout the loop.

On the western side of loop B near units 50 and 52 is an infestation of western dwarf mistletoe (Arceuthobium campylopodum) in Jeffrey pine. This is the western extension of a larger infestation near the entrance road to the boat ramp. Along the reservoir and throughout loop A and part of loop B, many of the lodgepole pines are infested by dwarf mistletoe (A. americanum). Some of the overstory pines are heavily infected by this mistletoe and have large witches' brooms. Most of the understory is not adversely affected at this time, but it is beginning to be infected. Many of the larger lodgepole pines have sunken bole cankers caused by Atropellis pini-phila. The number of cankers is more abundant closer to the reservoir. Bole and branch cankers of western gall rust, caused by Peridermium harknessii, were also observed on lodgepole pines. Some of the old-growth white firs in loop B have dead tops, probably a result of attack by the fir engraver (Scolytus ventralis).

On the southeastern side of loop C the red fir is infected by dwarf mistletoe (A. abietinum f.sp. magnificae) and branches are flagged, probably a result of infection by the canker fungus, Cytospora abietis. Many of the overstory red fir also have one or more conks of the Indian paint fungus (Echinodontium tinctorium). Throughout the campground are many annosus root disease centers affecting the true firs. The size of individual centers is variable from single trees to 0.25 acres. It is probable that live, standing firs, especially old-growth, are also infected by Fomes annosus, but external indicators are not available.

Red Feather Campground

Vegetation in this campground is similar in species mix and size to that in loop B. Dense thickets of lodgepole pine regeneration exist within loop D at the north end and near the entrance to the loop. The vegetation at loop E is denser with a larger amount of Jeffrey pine sawtimber and more understory vegetation.

The lodgepole pine in this campground has two pest organisms: dwarf mistletoe and Atropellis canker. The dwarf mistletoe is heavier in this campground than in Little Beaver, especially along the reservoir. The number of Atropellis cankers is heaviest on the north side of loop E near units 30, 31 and 33. Pine engraver beetles (Ips pini) were starting to bore into and breed in lodgepole pine slash near unit 17. Fomes annosus was again identified in true fir in numerous centers throughout the campground. Two sugar pine saplings, one at unit 7 and one at unit 14, are infected by blister rust, Cronartium ribicola.

Running Deer Campground

This campground supports a mature, mixed conifer stand. There is a dense thicket of lodgepole pine regeneration north of unit 24. The south and west sides of the loop are covered by a more dense, second-growth mixed conifer stand as compared with the rest of the campground.

Similar pests exist in this campground as in the previously discussed campgrounds, with dwarf mistletoe infecting the lodgepole pine along the reservoir and annosus root disease in the true firs. One annosus root disease center was found in Jeffrey pine near unit 39. Pine engraver activity was noted in lodgepole pine winter breakage near the reservoir.

A group of dead and dying lodgepole pines is near units 27 and 28. These trees have bole cankers from western gall rust infection and are being girdled; they are also under attack by Pityophthorus sp., a secondary bark beetle. Atropellis cankers were also seen on the larger lodgepole pine. The remains of several burn piles exist in the campground and are surrounded by trees with scorched crowns.

Boat Ramp/Beach

The vegetation along the entrance road to the boat ramp and Little Beaver Campground consists of young-growth, mixed conifer species. The stocking levels appear adequate with some denser aggregations. Thickets of lodgepole pine regeneration are developing in some openings. Along the boat ramp circulation road is a dense stand of white fir, lodgepole pine, and red fir. The area around the boat ramp and beach is mainly lodgepole pine and white fir with smaller numbers of Jeffrey pine and red fir.

The Jeffrey pines on the north side of the entrance road are infested with western dwarf mistletoe. Some of the trees have large witches' brooms and are heavily infected. Blister rust was noted on some sugar pine saplings and Atropellis cankers are on lodgepole pines in this area. Lodgepole pines around the parking area at the boat ramp are infected by dwarf mistletoe. The crowns of other lodgepole pines in this area have been top-killed, possibly because of pine engraver attacks. Initial attacks by pine engraver beetles had started in some green lodgepole pine slash in this

area. Some of the old-growth true firs along the road to the boat ramp have dead or dying tops, probably a result of attack by the fir engraver. Annosus root disease was found in true firs in several locations along the circulation road and was involved in some windthrow.

Area North of the Campgrounds

The overstory vegetation in this area is comprised mainly of mature red fir and lodgepole pine with a smaller component of white fir and Jeffrey pine. White fir, incense-cedar, and lodgepole pine are the main tree species in the understory. In general, the stand is heavily stocked with some small openings scattered throughout. Because of time limitations we did not attempt to locate root disease centers; however, it is highly probable that annosus root disease is present in some of the true fir. Dwarf mistletoe and Atropellis cankers were observed in lodgepole pine, as was blister rust in sugar pine. Some of the larger true firs have top-kill of recent origin, probably a result of fir engraver activity.

Area South of the Campgrounds

This stand is made up of old-growth red fir and lodgepole pine and is heavily stocked. We did not get on the ground in this area, but can suggest that at least the following disease and insect situations probably exist: annosus root disease in true fir, lodgepole pine dwarf mistletoe, and fir engraver.

PROGNOSIS

If no actions are taken in this recreation area, certain long-term effects of existing and potential pests can be expected. In general, mortality can be expected to increase. This increase will be a result of the intensification of dwarf mistletoes, windthrow associated with annosus root disease, competition because of heavy stocking, and increased bark beetle activity on stressed and nearby healthy trees.

Western dwarf mistletoe will continue to intensify and spread into surrounding Jeffrey pines. The rate of spread, however, will be slow and may be limited in some directions because of the non-host species intermixed in the stand. Intensification within individual trees will occur and the heavily infected trees will become more susceptible to successful bark beetle attacks. Lodgepole pine dwarf mistletoe will also spread into uninfested areas, as well as intensify in individual trees. Lodgepole pine regeneration beneath this infected overstory will become infected and will be adversely affected, especially if the present density is retained and the trees do not grow appreciably in height.

The number and size of annosus root disease centers will increase. As recently dead and hazard trees are removed, new infection centers may be initiated if no stump treatment occurs. These centers could start in either pine or fir stumps. Existing centers will continue to expand as

long as there is root-to-root contact in the fir. Occasional windthrow of fir will continue, primarily in the late fall/winter months when the soil is wet and high winds are likely. Annosus-infected firs in dense aggregates may be killed by insects because of the lack of sufficient root regeneration to replace those roots lost to the fungus. In the infection center in pine, the fungus will spread between all conifer species and mortality, especially of pine, will occur.

Bark beetle-related mortality will occur in association with the above diseases. In addition, this type of mortality will increase where aggregations are overstocked and competition for water and root space is high. During drought periods, bark beetle-related mortality will accelerate as this additional stress occurs.

MANAGEMENT ALTERNATIVES

For the sake of simplicity, the following alternatives are presented separately for each pest. However, the attainment of management objectives would best be accomplished by integrating the selected alternatives for each pest into overall vegetation management plans.

I. Annosus Root Disease

a. Stump treatment. Following tree falling, all conifer stumps should be treated with borax (sodium tetraborate decahydrate) according to label instructions (see FSM 2305 and 2331.33, R-5 Suppl. No. 90). Use of this pesticide will minimize the number of new root disease centers that become established.

b. Regeneration. In established root disease centers care should be taken in the selection of species for regeneration. Any hardwood species that would grow on the site could be planted. In pine infection centers hardwoods are the only group resistant to the disease. Conifer species available for planting within disease centers in true fir include Jeffrey pine and lodgepole pine. However, neither of these species should be planted in areas where their respective dwarf mistletoe is present. Although sugar pine would be a third species that could be planted, it should be avoided because of the hazard from blister rust.

c. Thinning. Living true firs in and on the margin of annosus root disease centers probably are or will be infected by the fungus. Because of the apparent low level of virulence of this fungus against true firs, it appears that actions can be taken that minimize the impact on individual trees. By reducing the competition and promoting the growth of residual trees through thinning, sufficient root growth may occur to replenish the number of roots lost to the fungus. However, once the main structural roots are decayed the probability of windthrow will increase.

II. Dwarf Mistletoe

a. Regeneration. When planting areas bordering dwarf mistletoe-infested stands, the species of planting stock should be different from that of the bordering stands unless those stands, are to be removed within 5 to 10 years.

b. Suppression. The simplest method of controlling dwarf mistletoe is through a harvest cut that eliminates the host. In situations where continuous tree cover is desired, such as recreation areas, this may not be possible. In these situations several alternatives are available.

1. Gradual conversion. The first step would be to open up the stand slightly by removing heavily infected and non-desirable trees. This would be followed by planting non-host species. As infection levels increased in residual trees, they would be removed releasing the understory and reducing the competition with the non-host overstory. The time involved to complete this program would vary considerably depending on the number of non-host species in the stand and the number of trees planted and their rate of growth.

2. Broom pruning. In certain situations where infected individual trees are considered of high value and need to be retained, pruning of witches' brooms may be advantageous. Although pruning will not eliminate the mistletoe, the removal of these large brooms, which use a large amount of the food and nutrients in a tree, can reduce stress on the tree, thereby prolonging its life until non-host replacement trees are established.

3. Eradication. In areas where the extent and intensity of mistletoe is limited, an eradication effort may be successful if done with considerable care and aggressiveness. This type of program would require removal of trees too heavily infected to undergo pruning or with infections in the upper 50 percent of the crown. Trees with infections in the lower 50 percent of the live crown could be pruned of all branches at and below the highest infected branches plus two healthy whorls above the highest infections. If the distance from the infection to the bole is less than 4 inches, then it is likely the mistletoe has entered the bole and pruning would not be effective. An effective buffer strip would be necessary between the treated stand and any surrounding infested stand to prevent reintroduction of the mistletoe. A retreatment of the stand would be required at 3 and 6 years after treatment to remove any infections that were missed or were latent during the initial treatment. The area of western dwarf mistletoe near loop B of Little Beaver Campground could be treated in this manner to prevent further spread into the campground. It would require the removal of a 40 foot strip of hosts to separate the infested and treated areas.

III. Bark Beetles

The pine and fir engraver beetles were the only numerous bark beetles in the campgrounds. A few standing lodgepole pines had heavy infestations of Pityophthorus sp., but the impact on the stand is minimal and likely to remain so. The relatively few Jeffrey pine present gave no indication of a past history of Jeffrey pine beetle. Likewise, evidence of mountain pine beetle in the lodgepole was rare. This may be due in part to campers removing downed lodgepole for firewood, but there was little evidence of this insect in areas surrounding the campgrounds.

Maintaining, and even augmenting, the tree species diversity in the stand should help contain the development of problems with bark beetles. Soil compaction cannot be avoided in some high-use areas, but screening and barrier vegetation could be used to prevent soil compaction in areas where trees might be particularly susceptible to stress, e.g. very moist areas, or areas of heavy soils. Posting of educational materials, such as "Trees Need Their Skins Too", might help reduce mechanical wounding that reduce tree vigor and sometimes produce injury favorable to insect infestation and development.

Should unusual stress, such as drought, cause high susceptibility to bark beetle attack, the extensive water system in the campground could be used to irrigate the highly valued individuals. Protective insecticidal sprays are available to prevent attack on pines, but these can be applied only to about 60 feet in height. Spraying plus irrigation might be the most effective technique.

Several areas within the 160 acres are heavily overstocked. These should be thinned to reduce stress and lessen the risk of successful bark beetle attacks. Stocking reduction should occur after Labor Day, when most of the campers have gone, and before the onset of weather that prevents accessibility. Upon resumption of bark beetle activity in the spring, the slash will no longer support brood development, particularly if the slash has been lopped and scattered. Lopping and scattering could occur in the spring along with the cleanup of any winter breakage and blowdown.

Slash, breakage, and blowdown could be bucked and moved for easy accessibility by the campers. However, such quantities should not be stacked if the wood would remain for a period exceeding 14-18 days. Wood should never be piled against a living tree.

Personnel frequently within the campground should keep alert for pitch tubes on pines and pitch-streamers on firs. Pines with developing broods can be felled and bucked into small pieces for immediate use in campfires. Clear pitch-streamers on the boles of green firs frequently indicate healing at the sites of aborted fir engraver attacks. They also indicate recent beetle activity and the increased likelihood of top kill in other firs in the area.

IV. Hazard Trees.

In any developed recreation area, the recognition and removal of hazard trees is required to reduce personal injuries and property damage. In the Little Grass Valley recreation area most of the hazard failures occur in the late fall through spring when soils are wet and snow and wind occurs. This reduces the likelihood of personal injury because of the closure of the recreation area at this time; however, substantial property damage can occur to fixed facilities. Also, if the area is eventually opened to winter use, then the probability of personal injury and property damage will increase if actions are not taken.

Several pest situations exist that increase the hazard potential in the campgrounds. These include annosus root disease, Indian paint fungus, and fir engraver in true fir and Atropellis canker in lodgepole pine. The root and butt rot of annosus root disease can result in significant hazard potential in true firs. External indicators of this problem are not readily apparent, although it can be expected that trees near infected stumps are also infected. Very thin-crowned, slow growing true firs in or adjacent to Fomes annosus centers are suspect of having severely-rotted roots. Large old-growth firs with basal wounds and decay should be examined closely for any lean and recent soil rising in the root zone. Loop C should be given special consideration as long as the old-growth firs are retained. The number of permanent structures in this loop should be kept at a minimum to reduce future losses and the loop should be closed once the fall rains and snow start in order to protect life and personal property.

Conks of the Indian paint fungus are hazard indicators in true fir. The probability that conk-bearing trees will fail is dependent on the severity of the decay in the heartwood and the thickness of sound sapwood surrounding the decay column. The severity of decay can be determined by observing the number, size, and separation of conks on a tree. Each conk has associated with it a decay column in the heartwood. When two or more conks are on a single tree, these columns can overlap. If the conks are more than 10 feet apart, then it is assumed that the tree is unmerchantable. In recreation areas, trees with multiple conks should be examined closely for other defects, especially any that could interact with or accentuate the decay problem. The size of the conk is related to its age and the severity of decay. When a conk is greater than 6 inches across, the associated decay is advanced and the wood has little, if any, structural strength remaining. However, if the surrounding sapwood is sound and of sufficient thickness, then the structural weakness of the tree may be minimal. The sufficiency of sapwood is dependent on tree diameter and the thickness of sound sapwood. This relationship is expressed by the equation:

$$Y = -0.04 + 0.15 X$$

Where

Y = thickness of sound sapwood

X = diameter of tree inside bark

If Y is equal to or greater than the right side of the equation, then the tree has lost no more than one-third of its strength and is relatively safe. This assumes that there are no other defects in the tree, such as wounds, cankers, leans, etc.

In addition to root rot and heartrot, true firs are subject to top-killing by fir engravers. These dead tops are susceptible to decay and eventual breakage. Generally, breakage occurs during high winds associated with fall storms, thereby reducing the hazard, except to permanent structures. However, firs with dead tops should be given careful consideration for treatment because of the probability of failure of these tops.

Most Atropellis cankers in lodgepole pine have a low probability of failure. The probability increases, however, when either of two situations occurs. The first is when deep cankers occur above the first 16 feet of the bole. The second is when two or more large cankers occur in the same section of the bole on different faces. This appears to substantially alter the cylindrical nature of the bole and result in increased failure.

When evaluating trees for hazard, a complete examination for defects from the roots to the top is necessary. This evaluation can determine the likelihood, or probability, of failure of the tree or tree part. In addition, the potential for damage can be estimated. This damage potential depends on the size of the failing tree or tree part, that is, whole tree failure is expected to cause more damage than limb failure. A third factor to consider during the evaluation is the likelihood of impacting a target. Permanent structures, such as restrooms and picnic tables, within striking range have a high potential, whereas hikers on a lightly-used trail constitute a low probability for impact. Finally, target value needs to be determined. Physical structures can be valued at their replacement or repair cost. It is recommended that recreationist occupancy be valued at a constant level. Based on past records on personal injuries and property losses this value has been determined to be \$4000 in 1969 dollars. The hazard rating for the tree is the product of these four factors and, for fixed property, provides a direct estimate of the expected dollar loss if the hazard is not reduced. For recreationist occupancy, it provides an estimate of expected loss. These estimates can be compared to an administratively-established hazard control level above which hazard abatement will take place.

For further information and details on hazard trees and hazard control programs, contact the Forest Pest Management Staff.

APPENDIX 1

BIOLOGY OF PEST ORGANISMS

Fir Engraver (*Scolytus ventralis*): The fir engraver attacks most true firs in western North America. Attacks can result in a) mortality, b) top-kill, or c) patch kill along the bole in firs ranging from larger saplings to the over-mature. Mortality and top-kill frequently are associated with stress induced by overstocking, drought, root disease, soil compaction, excessive and sudden exposure, heavy dwarf and true mistletoe infections, and other factors limiting tree health and vigor. Because of the sporadic occurrence of widespread, severe mortality and top-kill, and the prevalence of healthy broods in living trees (patch attacks), direct control measures are generally impractical. A healthy, vigorously growing stand is the best means of minimizing losses.

Adults fly and attack trees or green fir slash between June and September; larvae, pupae and adults overwinter under the bark of infested trees. The life cycle takes one year, rarely two. Pitch tubes are not formed as with pine bark beetles, but attacks are often characterized by boring dust in bark crevices along the trunk and pitch streamers on the mid- and upper-bole. Trees successfully attacked early in the summer may exhibit fading of the foliage by early fall, but those attacked later in the year will not begin to fade until the following spring/summer. The beetles may have emerged by the time the tree fades.

Several other species of *Scolytus*, along with *Pseudohylesinus*, may be associated with the fir engraver. These contribute to the damage, but usually are not primary insects. The roundheaded fir borer, *Tetropium abietis*, also is a frequent associate.

The Pine Engraver (*Ips* spp.): These beetles are common throughout western North America. They are most commonly found attacking freshly cut logs, slash and breakage, and tops and limbs of ponderosa, Jeffrey and lodgepole pines. Attacks on tops and limbs may precede or occur in conjunction with attacks by *Dendroctonus* bark beetles. When suitable host material is plentiful, such as slash or drought-stressed pines, large numbers of beetles may develop and aggressively attack healthy green pines. Young pines from 2 to 8 inches (5-20 cm) in diameter and the tops of older trees are the host material most at risk. This is particularly true of densely stocked groups of trees. Fortunately, outbreaks are usually of short duration and seldom last more than one season.

Attacking adults may be found under the bark constructing a typical three or four egg galleries from a central nuptial chamber. These galleries run parallel with the wood grain and assume a Y or H pattern. The galleries are kept clear by the adults and consequently the reddish boring dust piles near the entrance holes. The dust is particularly visible on horizontal host material such as blowdown. On vertical trees it catches on bark flakes and

crevices, and spider webs. In the Little Grass Valley area two or three generations could be expected per year - two summer generations following spring emergence of adults and possibly a third that will overwinter as adults, either under the bark or in forest litter.

The factor primarily controlling beetle numbers is the presence of suitable host material. Therefore, management practices should provide the least possible quantity and quality of suitable material. This can be done by utilization or treating residues in such a way that the inner bark quickly desiccates - lop and scatter, chipping, burning. Deferring slash-producing activities until after July 1 also reduces the likelihood of pine engraver damage. By proper disposal of slash and windthrown material, and maintenance of tree vigor through thinning of dense immature stands, outbreaks in standing trees and top-killing can be minimized.

Annosus Root Disease (Fomes annosus): Fomes annosus is a fungus that attacks a wide range of woody plants, causing a decay of the roots and lower bole and death of sapwood and cambium. All conifer species in California are susceptible to the fungus. Hardwood species are rarely damaged or killed. In one instance madrone (Arbutus menziesii) was attacked. Infected pines are usually killed rather rapidly when the fungus girdles the root collar. Older true firs and incense-cedars usually survive infection for many years, although butt and root rot may become extensive, resulting in tree weakening and windthrow.

During favorable periods, the fungus forms fruiting bodies in decayed stumps, under the bark of dead trees, or in the duff at the root collar. The fungus becomes established in freshly cut stumps from air-borne spores produced by the conks, and then grows into the root system. True fir can probably also be infected by spores invading fresh basal wounds. The fungus subsequently spreads to healthy roots of surrounding susceptible tree species via root contacts. In general, infections will cross from pine to true firs; however, rarely is the fungus observed to go from true fir to pine. Local spread of the fungus outward from a stump typically results in the formation of disease centers, with dead trees in the center and fading trees on the margin. These centers usually continue to enlarge until they reach barriers such as openings or groups of nonsusceptible plants.

The fungus may remain alive for as long as 50 years as a saprophyte in infected roots and stumps. Young susceptible tree species often become infected and die after their roots contact old infected root systems in the soil.

Dwarf Mistletoes. Western (Arceuthobium campylopodum); Red Fir (A. abietinum f.sp. magnificae); Lodgepole Pine (A. americanum): Western dwarf mistletoe infects Jeffrey, ponderosa and Coulter pines. Red fir is the only host for red fir dwarf mistletoe, just as lodgepole pine dwarf mistletoe infects only lodgepole pine. Other conifers are rarely infected and hardwoods are immune to these pathogens. The pathogens are obligate parasites obtaining their nutrients, minerals and water from the host.

These parasites are dioecious, perennial higher plants that produce seeds as their means of spread. In the fall of the year when the fruit falls from the stem, the seed is ejected upward and outward. The seed (covered with viscin, a sticky, gelatinous substance) adheres to any surface it contacts. When the seed lands in the crown of a susceptible host tree, it adheres to a needle or limb and overwinters. The following spring it germinates and penetrates the limb. For the next 2 to 4 years the plant grows in the tree limb, developing a root-like endophytic system in the inner bark and outer sapwood. It then produces aerial shoots and in another 2 to 4 years produces reproductive structures.

Spread of dwarf mistletoe is limited to the distance traveled by the seed, which from overstory to understory is usually 20 to 60 feet, but may be as much as 100 feet if wind assists the seeds. A rule of thumb is that dwarf mistletoe can spread horizontally to the understory a distance equal to the height of the infection in the overstory tree. Because of the various limits to spread, such as height of the source plant, angle of discharge, wind velocity, stand density, etc., the actual spread rate through an even-aged stand is about 1 to 2 feet per year.

Western Gall Rust (*Peridermium harknessii*): The hosts for this rust fungus include all species of hard pines; it was observed only on lodgepole pine in the campground areas. On lodgepole pine the principal symptoms are either bole galls or hip cankers. The fungus can survive in these galls and cankers for many years and produce orange spores in the spring that directly reinfect the pine. The fungus can kill seedlings, but usually does not directly kill larger trees. However, the bole galls and cankers may weaken the trunk sufficiently to result in stem breakage.

White Pine Blister Rust. This rust disease, caused by *Cronartium ribicola*, attacks sugar and western white pines and several species of *Ribes*. The fungus is an obligate parasite which must alternate between *Ribes* and white pines. Spores produced on the pine branch and stem cankers in the spring infect the leaves of *Ribes*. Spores produced on *Ribes* leaves in the fall infect the needles of white pines. The fungus grows from the pine needle into the branch, where it forms a canker. This process can take from 2 to 3 years. The branch cankers enlarge and grow toward the main stem. Those within 24 inches of the stem have a good chance of reaching the stem and causing a stem or bole canker. Branch cankers cause branch flagging and in themselves are not very damaging to the tree. The real damage is done when the rust invades the main stem and causes a bole canker. Here the rust eventually girdles and kills the tree.

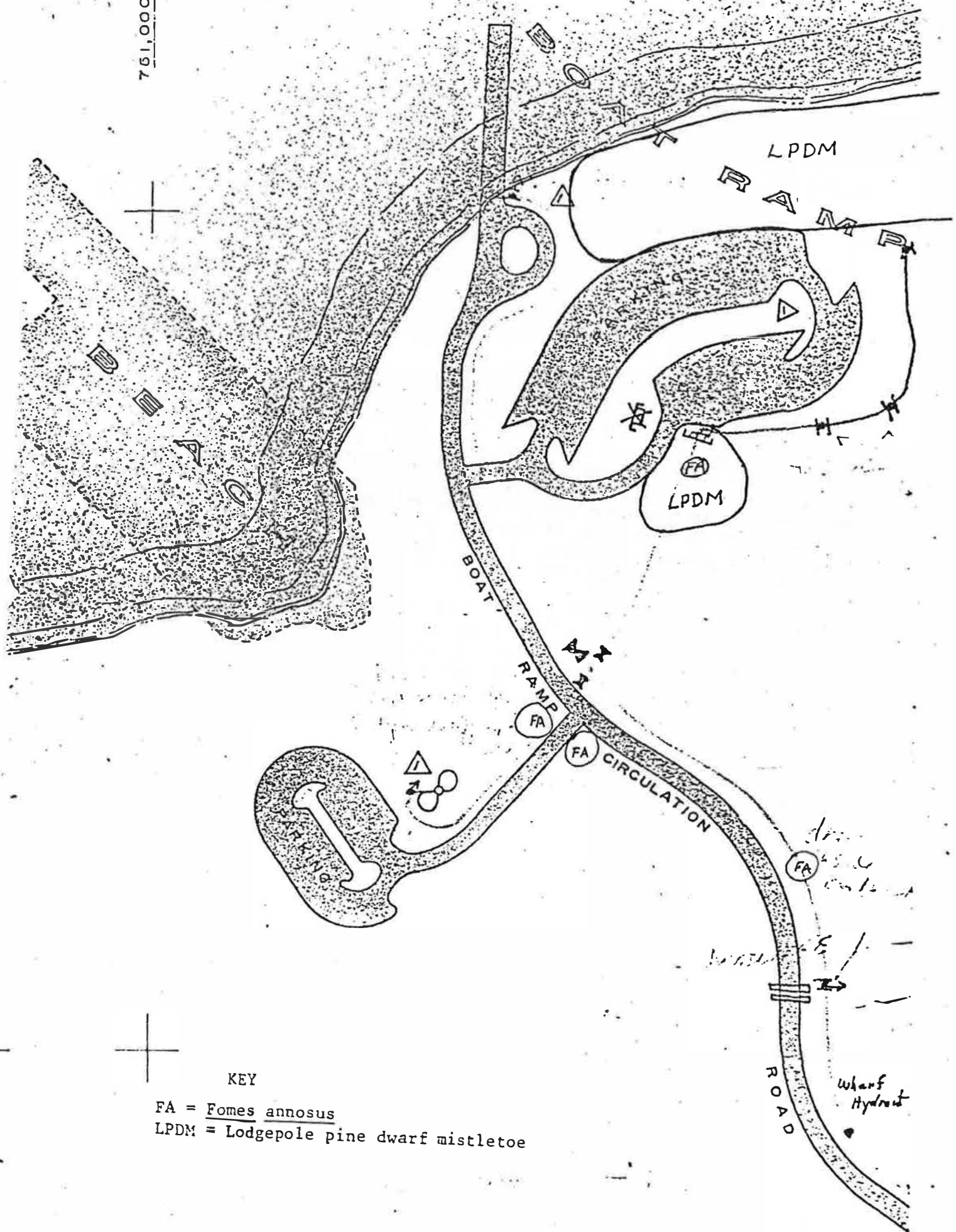
Rust infections in California occur most often in cool moist sites such as stream bottoms or around meadows. Temperature and moisture conditions are critical and must coincide with spore dispersal if infection is to occur. There are relatively few sites where these conditions occur frequently and infection takes place year after year. In most rusted sites, infection occurs only periodically when favorable conditions occur at the right time.

These favorable periods of high infection are called wave years; 1976 was such a wave year. As one moves from the sites most favorable for rust to sites less favorable, the frequency of wave years decreases.

Atropellis Canker (*Atropellis piniphila*). *Atropellis* canker occurs as a perennial canker, principally of lodgepole pine in the Pacific Coast States. It causes an elongate, sunken depression on the bole, usually at a branch whorl. The canker may exude considerable resin and the wood behind it is stained bluish-black. The fungus produces small, disc-shaped fruiting bodies on the canker face which release spores during the host's growing season. New infections are thought to occur through undamaged bark of the stem and living branches, mainly in the nodal region. As host tissue ages, susceptibility to infection changes with the greatest susceptibility during the sapling and pole stages. Cool, moist sites appear to favor the occurrence of the disease.

Indian Paint Fungus (*Echinodontium tinctorium*). The primary hosts of this fungus in California are the true firs. Infection results in a brown stringy rot of the heartwood that may result in a hollow being formed. Conks of the fungus are very distinctive, being dark and woody with a rust red interior. The lower surface has hard, coarse teeth or spines while the upper surface is black and rough. When a tree bears two or more conks that are separated by more than 10 vertical feet, then extensive decay of the heartwood is present. Individual conks less than 6 inches across usually indicate that the decay has not reached the advanced stringy stage.

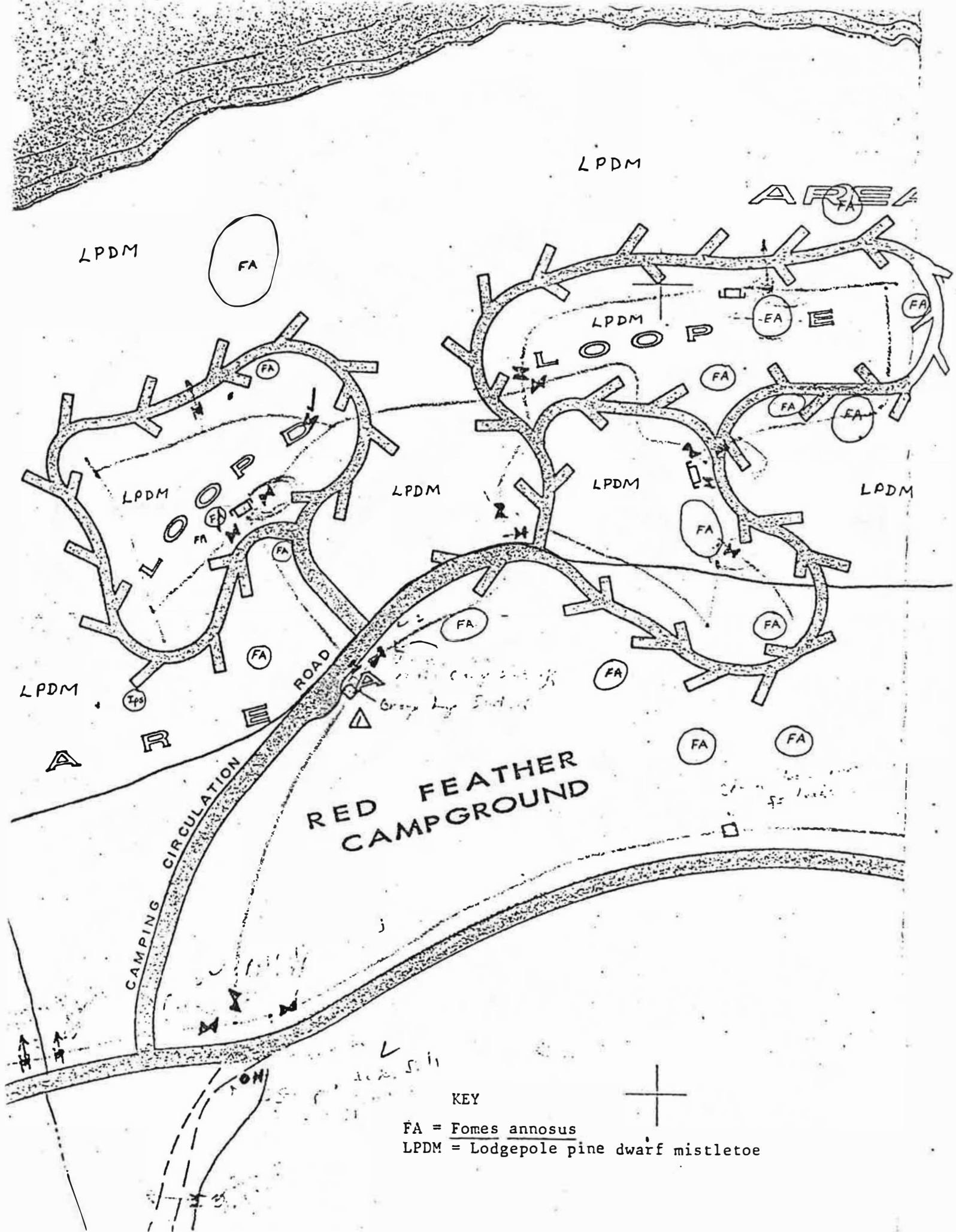
Infection occurs when spores germinate on stubs formed from the breaking of shade-killed branchlets less than 1 mm in diameter. These stubs are overgrown by new wood and the fungus remains quiescent for up to 50 years causing no decay. It is postulated that large branch stubs or large wounds may cause reactivation of the fungus resulting in decay.



KEY

FA = Fomes annosus

LPDM = Lodgepole pine dwarf mistletoe

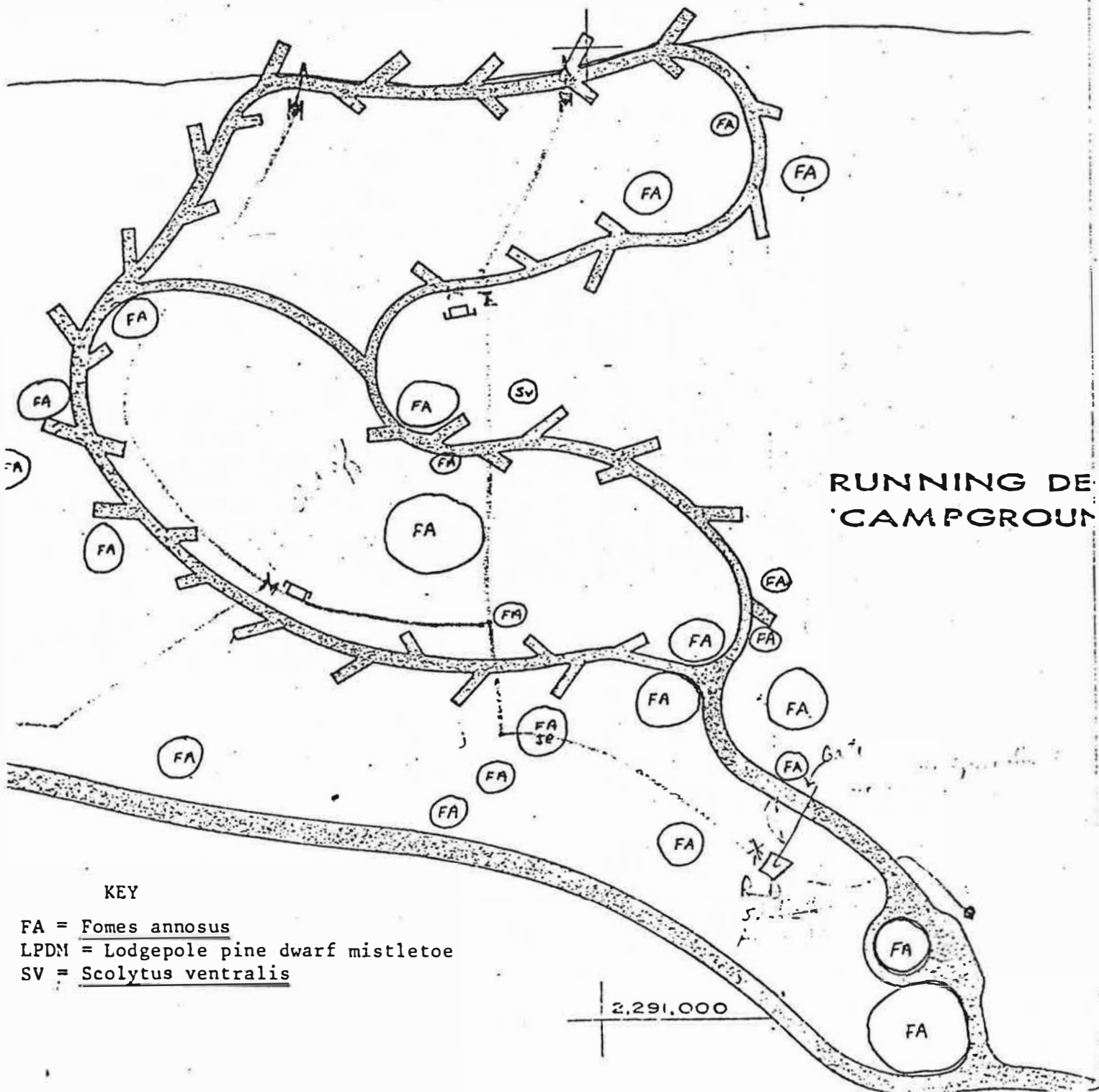


LPDM

AREA 7 (Ips)

LPDM

LPDM



KEY

FA = Fomes annosus

LPDM = Lodgepole pine dwarf mistletoe

SV = Scolytus ventralis

MAILING LIST #3 (Developed Recreation Site I&D's) *for construction of land and disease
Litter, etc. recreation areas of Little
Grass Valley Recreation, La Porte Ranger
National Forest*

COPIES OF THIS MEMO/REPORT TO:

Report No. S2-31
4/3/82

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Burnaby, B.C., Canada V5A 1S6
1 FPM Admin. Group, R-5 (with copy of list) (file)
1 Ladd Livingston, Idaho Dept. Lands
10 WESTFORNET-PSW (with cover memo from WLF)
5 WESTFORNET- INT (with cover memo from WLF)
1 W.H. Sager, HDF&W
1 John Chaffin, R-5
1 Peter Gaidula, CA Dept. Parks & Recreation
- 1 FPM, MAG
1 W.G. Charter, TM, R-5
1 G.R. Davies, TM, R-5
1 J.N. Fiske, TM, R-5
1 Canadian Forestry Service
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12 R. Hunt, CDF
1 R.V. Clayton, Pacific Islands Forester, HA
1 Y.M. Tanimoto, HDF&W
1 John Pierce, FPM (w/copy of this list)
1 Biol. David Cibrian Tovar
Laboratorio de Entomologia Forestal
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- 9 UC Berkeley people: D.L. Dahlsten, F.W. Cobb, W.E. Waters, J.R. Parmeter,
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4 Coop. Extension Foresters: Tom Robson, Pete Passof, Paul Smith, Rick Standiford
14 Other-Region FPM Staff Directors: R-6, R-4, R-3, R-2, R-1, R-10 (Anchorage),
NA (4), SA (4) [addresses in FS Org. Directory] ~~***~~
4 Other R-5 Staff people: Staff Directors: CFF, AP&D, OI, Recreation (w/copy of this list)
3 FES people (other than PSW): PNW, Corvallis: ~~B.E. Wickman~~, E.E. Nelson, G.E. Daterman
6 BLM: Sacramento, Bakersfield, Susanville, Redding, Ukiah, Folsom *PNW, 2 Genl: B.E. Wickman*
1 Regional Director, NPS, San Francisco (Attn: Plant Ecologist)
- 9 National Park Superintendents: Lassen Volcanic, Redwood, Sequoia & Kings Canyon, Yosemite,
Point Reyes National Seashore, Whiskeytown NRA, Pinnacles
National Monument, Santa Monica Mountains NRA, Lava Beds NM
- 17 National Forest Supervisors: All (except *Plumas* N.F.*)
- 78 R-5 National Forest Ranger Districts: All (except *La Porte RD, Plumas NF **)
- 2 R-5 FPM people: D.R. Hart, B.T. Sturgess (w/copy of this list)
1 BIA: W.E. Finale, Sacramento, CA
- 3 Others: Roy Richards, CFPCAC Chairman
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